

Patterns of Drug Use by Type in a Prepaid Medical Plan

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AN INCREASING recognition of the potentialities of prepayment as a method of helping consumers pay for prescription drugs has been accompanied by an increasing interest in prescription drug utilization and costs under existing prepayment schemes. Patterns of prescription drug utilization and costs can be described in several dimensions. In this paper, 1 year's cost and utilization experience under a prepaid drug benefit is described and analyzed in terms of therapeutic purpose of the drugs prescribed. Individual prescriptions were studied to arrive at the frequency and cost of drugs allowed for payment and were further identified as to patient characteristics.

The 1960-61 benefit year experience of the Group Health Association of Washington, D.C., a consumer-sponsored prepayment group practice plan, provided the data for this study. In the spring of 1960, when the drug benefit was installed, 26,954 premium plan enrollees became eligible for prescription drug coverage. Persons who incurred more than \$25 in prescribed drug expense in a 12-month period were to be reimbursed 80 percent of the amount spent above a \$25 deductible.

Duplicate prescription forms, generally carbon copies of the physician's original order, were

filed with the subscriber's annual drug reimbursement claim. These prescriptions were subsequently audited by GHA for contract compliance in regard to type of drug, prescribing physician, and date filled. Only drugs requiring a prescription were allowed for payment, excluding drugs such as vitamins. Additionally, only drugs prescribed by GHA physicians and filled during the benefit year were allowed for payment.

A sample of 515 claimants was chosen from the 1,179 enrollees who filed valid claims. Their 8,919 individual prescriptions which were allowed for payment provided the data for this analysis. A total of 19,510 prescriptions were allowed during the benefit year under study.

This sample was subsequently used to derive claim estimates for the entire GHA population insured for prescription drugs. Estimates of total utilization by therapeutic type were prepared by inflating the 8,919 sample prescriptions stratified into eight age classes to conform to the total numbers of prescriptions claimed in each age class, available from GHA records. In this way sampling error arising from proportionally unequal age representation was minimized. Similarly, prescription charges by therapeutic type were adjusted in accordance with total charges for all allowed prescriptions.

These estimating procedures were employed to reduce known sampling bias as much as possible, thereby enhancing the accuracy of the results. The composition of the enrolled population was available from GHA membership records.

Prescription data are presented according to therapeutic drug types in 14 specific categories, 1 category combining several relatively uncommon types, and a residual unclassified group.

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The unclassified group is composed of prescriptions which could not clearly be placed within any single therapeutic type—for example, if there were no basis for selecting the dominant ingredient in a prescription combining several ingredients.

The coding phase of the study was conducted by a physician and a statistical clerk, with the physician making the initial decisions on specific drug classifications. Most of the drugs were readily placed in the selected therapeutic groupings with a minimum of difficulty, although a small proportion were not easy to classify. "New and Non-Official Drugs," "American Drug Index," and the "Physicians' Desk Reference" were used as guides in classifying drugs by therapeutic type (1-3).

Combinations with several drug ingredients were occasionally troublesome to code because various components conceivably could be placed in separate medication classes. In general, an attempt was made to determine which ingredient in a combination was the dominant agent for which the mixture was ordinarily prescribed. For example, antispasmodic agents when combined with barbiturates were assigned to the former type because such combinations are marketed primarily for their antispasmodic and not their sedative action.

Ninety prescriptions which were illegible or of unknown therapeutic type were redistributed proportionally among the other drug classes, again within eight age groups.

The data must be interpreted with some caution because all prescription drugs included in the tabulations are for persons whose annual drug expenditures exceeded \$25. If the prescriptions for enrollees spending less than this amount had been reported, some differences in the patterns of drug frequencies and costs might have been observed. Data comparing the GHA experience with available national prescription statistics will be presented in conjunction with some of the analyses to follow.

The demographic characteristics of the insured population affected the observed drug utilization patterns to a large extent. Since the plan's membership was composed primarily of employed subscribers and their dependents, there is relatively less data available on the consumption of drugs by older persons. Where

age-specific data are presented, however, they should be useful in application to other populations for analytical or predictive purposes. Age-specific information is not presented in all instances in order to avoid breaking up the available data into many cells of low reliability. The aggregate data from this study should be valuable in planning similar drug benefits for employed groups of subscribers.

A final qualification is offered regarding the mode of practice of GHA physicians who, under the terms of the GHA contract, prescribed all of the drugs covered by the plan. GHA physicians are grouped in one large medical clinic facility in downtown Washington and another outlying branch clinic in suburban Maryland. Close interprofessional ties among the physicians might be expected to contribute to some standardization in drug therapy, at least for certain common ailments.

The distribution of prescriptions, both new and refill, by therapeutic type is shown in table 1. The anti-infective class was the most frequent, representing 13.3 percent of the total. The next two in descending order of occurrence were the psychotropic and the cardiovascular

Table 1. Distribution of prescriptions by therapeutic type, percent refill, and percent generic, GHA premium plan, 1960-61

Therapeutic type	Number of prescriptions	Percent of total	Percent refill	Percent generic
Total.....	19, 510	100. 0	37. 5	12. 2
Anti-infective.....	2, 603	13. 3	28. 3	14. 8
Psychotropic.....	2, 059	10. 6	53. 5	4. 3
Cardiovascular.....	2, 031	10. 4	39. 7	27. 9
Antihistamine.....	1, 574	8. 1	38. 1	0
Sedative.....	1, 566	8. 0	41. 4	22. 9
Hormone.....	1, 390	7. 1	49. 1	24. 5
Analgesic				
Non-narcotic.....	1, 097	5. 6	40. 4	2. 2
Narcotic.....	255	1. 3	3. 4	8. 4
Dermatologic.....	1, 239	6. 4	23. 6	2. 3
Antispasmodic and gastrointestinal.....	1, 162	6. 0	44. 0	3. 4
Diuretic.....	1, 079	5. 6	43. 0	1. 7
Eye, ear, nose, and throat.....	639	3. 3	26. 4	. 7
Adrenergic.....	626	3. 2	31. 9	11. 1
Cough preparation.....	335	1. 7	16. 2	. 6
Allergy injection.....	299	1. 6	7. 1	51. 5
Other drug types.....	523	2. 7	25. 2	15. 1
Unclassified.....	1, 033	5. 3	38. 0	19. 5

types, each with more than 10 percent. If the psychotropics and sedatives were merged, as is occasionally done in some drug series publications, the combined class would rank first with more than 20 percent of all prescriptions.

National prescription surveys conducted by the *American Druggist* for 1961 indicate prescription frequencies by therapeutic type fairly similar to those in table 1. For example, anti-infectives (internal) accounted for 18.7 percent of all prescriptions, and sedatives and tranquilizers accounted for 15.5 percent (4).

Allergy injections were a unique prescription item covered through the GHA contract. These injections were normally given at the clinic by either a physician or nurse rather than being dispensed through retail pharmacy channels. In terms of prescription volume they comprised 1.6 percent and accounted for 2.5 percent of prescription costs.

The hormone class data were further refined into specific types of hormones including new synthetic substitutes. This breakdown (not shown in the tables) indicated that insulin and related oral antidiabetic agents comprised 33.3 percent of the total hormone prescriptions, sex hormones 27.6 percent, thyroid preparations 17.7 percent, and corticosteroid hormones the remaining 21.4 percent.

Of all prescriptions, 12.2 percent were written by generic name. Generic prescribing was concentrated in the following therapeutic categories: allergy injection, cardiovascular, hormone, sedative, and anti-infective. Some prescription types rarely, if ever, were ordered by generic name such as eye, ear, nose, and throat drugs; cough preparation; and antihistamine. Generic prescribing was generally limited to a small number of standard remedies such as phenobarbital, thyroid, and digitalis. Many individual drugs rarely appeared by generic name.

The GHA plan physicians had not subscribed to the prescribing of drugs on a generic basis at the time these prescriptions were ordered. Hence, the degree of generic prescribing which was found was representative of the usual inclinations of the plan's physicians. GHA physicians have subsequently been encouraged to prescribe by generic name whenever feasible.

The ratio of refill prescriptions to either total or new prescriptions is often given as a crude index of the amount of drug use by persons on long-term or maintenance therapy. The highest percent of refills was observed for the psychotropic group. In descending order of occurrence, the following types also had at least a 40 percent refill ratio: hormone, antispasmodic and gastrointestinal, analgesic, diuretic, and sedative. Even the anti-infective group had a 28.3 percent refill ratio, suggesting use with chronic infections.

The comparable national pattern of refill ratios by therapeutic type, as indicated by the *American Druggist* surveys (4), was very different. A striking example is the refill ratio for cardiovascular drugs of 75.7 percent compared to GHA's 39.7. The average refill ratio for all drugs combined was found to be 37.5 percent compared with 48.2 percent for the nation. If the prescriptions for enrollees spending less than \$25 had been reported, the GHA refill ratio might have been even lower. These differences are difficult to interpret but may be partially explained by several factors besides sampling variation.

1. The greater financial and physical accessibility to medical care enjoyed by GHA enrollees might result in more frequent medical evaluations and changes in drug therapy.

2. The higher average prescription price observed among GHA drug claimants may be indicative of greater average dosage per prescription and therefore of lower refill incidence.

3. The GHA pharmacy, where most of these prescriptions were filled, evaluates refill prescriptions in terms of the patient's last physician visit and frequently calls the physician's attention to questionable refills.

The percentage of refills, however, may be considered an arbitrary standard for measuring long-term drug use. In many instances it underestimates the actual number of prescriptions consumed on a continuous or chronic basis because physicians do not authorize unlimited refills and may often change the drug being prescribed to another of the same therapeutic type.

Another way of measuring long-term drug use is shown in table 2, where a percentage distribution of persons is presented according to the number of prescriptions of a specified type

that they received during the benefit year. The drug types are arranged in descending order of percentage of persons receiving only one prescription per year of a specified type.

The breakdown for relatively homogeneous categories like sedative and psychotropic reflects chronic prescription use accurately. On the other hand, for broader drug types, the data are less reliable as an indicator of repeat prescription use because patients may be shifted from one unrelated drug to another, for example, from eye to ear medication. Diuretic drugs with 47.5 percent and cardiovascular with 47.1 percent of the patients obtaining 5 or more prescriptions annually were found to be reissued most frequently. Conversely, these two types of medication were infrequently prescribed on a one-time basis. Other therapeutic types often repeatedly refilled included psychotropic, hormone, and anti-infective. On the other hand, the therapeutic types in the lower part of this table such as cough preparation and eye, ear, nose, and throat medication were generally prescribed only once to any one patient.

A rank correlation between percent refill in table 1 and percent of persons receiving more than one prescription of a specified type in table 2 yielded positive and significant results. These two measurements thus point out similar patterns of repeat drug use.

Total prescription drug charges submitted as claims under the GHA plan during the first benefit year in terms of full retail price paid for the prescriptions are given in table 3 with a breakdown by therapeutic type. The anti-

Table 3. Distribution of prescription charges and average prescription price by therapeutic type, GHA premium plan, 1960-61

Therapeutic type	Total prescription charges	Percent of total charges	Per enrollee charges	Average prescription price
Total.....	\$82, 140	100. 0	\$3. 05	\$4. 21
Anti-infective.....	18, 969	23. 1	. 70	7. 29
Psychotropic.....	10, 522	12. 8	. 39	5. 11
Hormone.....	6, 974	8. 5	. 26	5. 02
Cardiovascular.....	6, 426	7. 8	. 24	3. 16
Diuretic.....	5, 416	6. 6	. 20	5. 02
Antihistamine.....	4, 989	6. 1	. 19	3. 17
Analgesic.....	4, 359	5. 3	. 16	3. 22
Antispasmodic and gastrointestinal.....	4, 245	5. 2	. 16	3. 65
Dermatologic.....	3, 424	4. 2	. 13	2. 76
Sedative.....	3, 277	4. 0	. 12	2. 09
Adrenergic.....	2, 087	2. 5	. 08	3. 33
Allergy injection.....	2, 018	2. 5	. 07	6. 75
Eye, ear, nose, and throat.....	1, 302	1. 6	. 05	2. 04
Cough preparation.....	685	. 8	. 03	2. 04
Other drug types.....	2, 544	3. 1	. 09	4. 86
Unclassified.....	4, 902	6. 0	. 18	4. 75

Table 2. Percent distribution of claimants according to the number of prescriptions that they received during a year, by therapeutic type, GHA premium plan, 1960-61

Therapeutic type ¹	Number of prescriptions per claimant					
	1	2	3	4	5-9	10 or more
Diuretic.....	13. 1	10. 1	16. 2	13. 1	41. 4	6. 1
Cardiovascular.....	14. 9	9. 1	16. 5	12. 4	28. 9	18. 2
Hormone.....	24. 0	20. 7	9. 3	9. 3	28. 7	8. 0
Anti-infective.....	25. 5	16. 7	11. 4	10. 6	29. 3	6. 5
Psychotropic.....	26. 5	11. 8	11. 2	10. 0	24. 7	15. 9
Sedative.....	27. 6	17. 3	14. 1	6. 5	19. 5	15. 1
Antispasmodic and gastrointestinal.....	35. 2	14. 4	9. 6	8. 8	24. 0	8. 0
Antihistamine.....	39. 3	15. 6	13. 3	7. 1	17. 5	7. 1
Dermatologic.....	41. 6	19. 1	13. 9	4. 6	13. 3	7. 5
Analgesic.....	42. 9	19. 4	6. 5	7. 6	16. 5	7. 1
Adrenergic.....	49. 0	18. 0	10. 0	7. 0	12. 0	4. 0
Eye, ear, nose, and throat.....	52. 9	19. 8	13. 2	5. 0	7. 4	1. 7
Cough preparation.....	64. 0	19. 1	9. 0	3. 4	4. 5	0

¹ Allergy injections are omitted since a part of their number was estimated and could not be tied to specific claimants.

Table 4. Percent distribution of prescriptions by therapeutic type and retail price intervals, GHA premium plan, 1960-61

Therapeutic type	Retail price				
	Below \$2	\$2-4.99	\$5-9.99	\$10-14.99	\$15 or more
Total.....	36.3	38.7	19.5	3.4	2.1
Anti-infective.....	17.8	38.5	28.8	5.1	9.8
Psychotropic.....	6.5	61.6	29.8	.9	1.1
Sedative.....	80.9	17.0	1.6	.3	.1
Antihistamine.....	39.4	46.5	13.3	.8	0
Cardiovascular.....	32.2	37.5	25.0	4.3	1.0
Hormone.....	31.1	32.8	27.9	6.8	1.4
Analgesic.....	44.2	39.1	14.0	2.6	.2
Dermatologic.....	56.9	37.8	2.9	2.0	.4
Antispasmodic and gastrointestinal.....	31.3	42.5	21.8	4.4	0
Diuretic.....	14.0	42.1	40.6	1.7	1.5
Adrenergic.....	38.5	50.0	9.0	2.1	.3
Eye, ear, nose, and throat.....	69.3	27.5	.4	2.9	0
Cough preparation.....	74.7	22.7	1.9	.6	0
Allergy injection.....	13.4	14.2	18.1	46.5	7.9
Other drug types.....	21.8	44.1	29.0	3.8	1.3
Unclassified.....	36.9	33.6	22.0	5.0	2.6

infective class constituted 23.1 percent of all prescription charges while comprising only 13.3 percent of the total prescriptions. The average price of all prescriptions was \$4.21. Drug types having higher than average prescription prices in addition to anti-infective were psychotropic, hormone, diuretic, and allergy injection. Average retail prescription prices by therapeutic type ranged from a high of \$7.29 for anti-infective to a low of \$2.04 for eye, ear, nose, and throat medication and cough preparation. These mean prescription price figures give an expected charge for each individual purchase. A description of the variability in prices around these average dollar figures is given in table 4 where the prescription charges actually paid are grouped in price intervals.

The average prescription price for all drug types of \$4.21 was considerably higher than the reported national data on prescription prices. For example, the *American Druggist* reported an average prescription price of \$3.22 in 1961 (4), the *Lilly Digest* a mean price of \$3.25 (5), and *Drug Topics* a mean price of \$2.97 (6). It is of interest that the Group Health Cooperative of Puget Sound, which operates both a prepaid drug benefit program and a pharmacy at the clinic center, reported that their average prescription cost was about \$1.40 in 1961 (7). This experience of GHC of Puget Sound is not

comparable, however, since their figure represents cost without profit. This plan operates its pharmacy under a generic formulary system. Furthermore, the GHC data include prescription drugs provided to all drug users, not merely those exceeding a \$25 deductible level as was the case in the Washington, D.C., plan.

The cost of prescription drugs per enrollee is indicated in table 3. These figures represent the amounts spent by claimants for each therapeutic drug, spread over all 26,954 enrollees, including claimants and nonclaimants. They are higher than the amounts that would be required for a premium charge for the drug benefit; the \$25 deductible and the co-insurance of 20 percent paid by the claimants reduced the cost to the plan overall by nearly 50 percent of the amounts spent by claimants. The data give an indication of the relative impact of different types of drug expenditures on a population group.

It is apparent that individual drug classes, except perhaps anti-infective and psychotropic, were not expensive to cover under an insurance contract. Hence, the exclusion of one or more drug categories would not have substantially reduced total prescription insurance costs to the plan.

Percent distributions of prescriptions in dollar price intervals are shown in table 4 by therapeutic type. A striking finding is that almost

Table 5. Percent distribution of GHA premium plan prescriptions, by retail price, age, and sex, 1960-61

Price interval	Both sexes			Male			Female		
	Under 19	19-54	55 or older	Under 19	19-54	55 or older	Under 19	19-54	55 or older
Total.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Under \$2.....	36.5	35.1	38.8	39.9	34.5	34.6	32.5	35.6	42.2
\$2-\$4.99.....	44.0	40.2	33.0	41.0	40.8	35.2	47.5	39.7	31.1
\$5-\$9.99.....	16.6	18.2	23.8	16.7	16.2	25.8	16.4	20.0	22.2
\$10-\$14.99.....	2.2	3.8	3.2	1.7	4.6	3.4	2.7	3.1	3.1
\$15 or more.....	.8	2.7	1.2	.6	3.8	1.0	.9	1.7	1.4

10 percent of anti-infective prescriptions were priced at \$15 or more. An antifungal drug, griseofulvin, accounted for the majority of high-price prescriptions in this category. The majority of the allergy injections also cost more than \$10. Other drug types with a notable percent of prescriptions costing more than \$10 were hormone with 8.2 percent and cardiovascular with 5.3 percent.

Several drug classes had a significant number of prescriptions under \$1.50 in price. Not shown in table 4, these types were, in descending order: sedative, cardiovascular, dermatologic, antispasmodic and gastrointestinal, and hormone. Phenobarbital, digitalis, and thyroid

hormones accounted for many of these low-priced prescriptions.

Table 5 shows a percent distribution of prescription prices in five price intervals, in terms of sex and broad age category.

The age group 19-54 had a lower proportion of prescriptions under \$2 and a larger proportion \$10 or more than the other two age groups, but prescriptions of less than \$5 were heavily predominant. Males aged 19-54 had more than 8 percent of their prescriptions in the more than \$10 intervals.

Prescriptions of less than \$5 were more frequent among claimants under 19 than among older claimants. Female claimants 55 and older

Table 6. Number of prescriptions per 1,000 enrollees, by age and therapeutic type, GHA premium plan, 1960-61

Therapeutic type	All ages	Age (years)							
		0-4	5-14	15-24	25-34	35-44	45-54	55-64	65 or older
Total.....	723.8	86.9	232.6	261.3	395.5	726.3	1,383.4	1,957.3	3,080.7
Anti-infective.....	96.6	38.8	88.4	59.6	49.9	77.5	177.1	135.8	184.9
Psychotropic.....	76.4	.4	4.4	17.1	78.2	98.7	188.1	161.0	134.5
Cardiovascular.....	58.1	0	.3	0	3.0	35.9	133.3	246.4	437.0
Antihistamine.....	58.4	11.7	53.9	30.7	30.2	88.7	81.3	75.2	75.6
Sedative.....	75.4	1.6	8.7	4.7	22.0	53.6	184.4	271.1	379.8
Hormone.....	51.6	3.2	12.8	16.3	13.4	47.8	103.8	209.5	102.5
Analgesic.....	50.2	.4	3.3	3.7	26.4	61.5	112.3	171.7	129.4
Dermatologic.....	46.0	7.7	11.1	47.5	40.6	35.5	70.7	100.9	258.8
Antispasmodic and gastrointestinal.....	43.1	1.2	5.9	20.5	14.1	54.6	67.6	121.2	302.5
Diuretic.....	40.0	0	0	6.8	7.4	40.5	60.9	154.7	400.0
Adrenergic.....	23.2	6.1	6.6	11.6	24.9	37.2	42.9	30.1	31.9
Eye, ear, nose, and throat.....	23.7	2.0	1.4	16.3	16.0	14.3	30.3	100.9	173.1
Cough preparation.....	12.4	9.3	12.0	2.4	3.7	11.6	15.8	20.4	75.6
Allergy injection.....	11.1	.4	.9	5.8	9.7	19.1	15.8	8.7	102.5
Other drug types.....	19.4	.4	0	5.8	8.9	19.7	42.0	70.8	68.9
Unclassified.....	38.3	3.6	22.8	12.6	46.9	30.1	57.0	79.0	223.5

had the highest proportion of prescriptions costing under \$2.

The varying patterns of drug use by drug type and age are presented in table 6. These age-specific patterns fundamentally reflect the kinds of morbidities which affect persons in different age groups. Most drug classes showed a sharply rising utilization curve with advancing age although the magnitude of the rise varied considerably between classes. As mentioned before, data for the 65 and older group were quite limited.

The number of prescriptions per 1,000 persons increased most steeply with advancing age for the following drug types: cardiovascular; diuretic; sedative; analgesic; eye, ear, nose, and throat; and antispasmodic and gastrointestinal. More gradually ascending curves were illustrated by anti-infective, antihistamine, adrenergic, and cough preparation. Psychotropic showed a rapidly increasing utilization rate up to the middle-age range, and then declined in the oldest age groups.

It is significant though not surprising that specific drug classes were consumed more extensively by persons in the older age range. Even cough preparations, which are sometimes thought to be used primarily for young children, presented an ascending age specific utilization pattern, although they were little used among enrollees between 15 and 34.

The following major conclusions can be drawn from the information gathered.

1. The anti-infective class of drugs was the most expensive to cover, accounting for about 23 percent of the total value of allowed prescriptions. The next costliest therapeutic class contributed less than 13 percent to the cost of the plan's operation.

2. Age was a prime determinant in explaining the variation in prescriptions submitted for payment per 1,000 enrollees by class of drugs.

3. Generic prescribing was practiced only on a limited scale for a few classes of medication.

4. The average prescription price was considerably above the national average, probably reflecting the prescribing of more expensive drugs in larger quantities for enrollees exceeding the deductible amount.

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